Barb - FYI - Something to discuss at our G+H site Mtg (LS)

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Reference No. 15942

Director, Waste Management Division
Attention: Mr. Kevin Adler, Remedial Project Manager
(HSRW-6J) Region V
United States Environmental Protection Agency
77 W. Jackson Boulevard
Chicago, IL 60604-3590

Dear Mr. Adler:

Re: Request for Revision of the Consent Decree/Scope of Work
Barrier Wall Performance Requirements
G&H Landfill
Macomb County, Michigan

This letter has been prepared on behalf of the G&H Landfill PRP Group (Group) to request approval to revise the Consent Decree/Scope of Work (CD/SOW) performance requirement for the soil/bentonite barrier wall. The CD/SOW for the G&H Landfill Site states that:

> "Settling Defendants shall design, construct, operate and maintain a groundwater gradient control network to provide an inward 2.0-foot hydraulic gradient across the barrier wall."

CRA believes that the 2-foot inward gradient is not required to ensure hydraulic containment within the landfill. Additionally, a 2-foot inward gradient may not be practicably achievable under certain circumstances, such as a draught period where the wetlands and water table downgradient of the barrier wall are lower than normal in comparison to groundwater upgradient of the barrier wall. We believe the 2-foot value is arbitrary and excessive, as hydraulic containment is demonstrated by the presence of any inward gradient.

The Group is requesting approval to delete the requirement for a 2-foot inward hydraulic gradient across the barrier wall and instead require that the Group maintain operation of the "gradient control network" (i.e. leachate collection system) in an equilibrium condition such that an inward gradient is maintained across the barrier wall. Additionally, it is requested that temporary reductions in the hydraulic gradient across the barrier wall be permitted during temporary and short-term shutdowns of the collection system and groundwater/leachate treatment facility for operational maintenance periods and routine repairs, as necessary.

It should be noted that the Group has been able to maintain inward gradients across the barrier wall under normal operating conditions with the exception of recent problems along the Sump S-9 collection system. The Group is currently implementing efforts to increase the pumping capacity in Sump S-9 with the addition of higher capacity pumps. It is expected that with the pump upgrades the Group will achieve inward gradients along the entire barrier wall in excess of 1-foot, which we believe is acceptable and comparable to other sites with barrier wall systems.

The U.S.EPA document "Evaluation of Subsurface Engineered Barriers at Waste Sites", EPA-542-R-98-005, August 1998, indicates that typical cross-barrier head differentials are greater than 1-foot. Furthermore, upon review of the remedial objectives for the 36 "better-managed" sites analyzed in this study, there were numerous sites without quantification of the inward head-differentials across the barrier wall while the highest inward head-differentials were 1-foot.

It should be noted that the lack of a clearly delineated inward gradient is not necessarily indicative of a breach in containment of the barrier wall since the barrier wall is a low permeability barrier. This can be demonstrated with the following calculation which assumes an outward gradient of 1-foot. The thickness of the barrier wall is a minimum of 24-inches (approximately 60 cm) and the actual as-built permeability of the soil/bentonite slurry wall ranged between 1.86×10^{-8} cm/sec and 8.71×10^{-8} cm/sec, with an average permeability of 4.63×10^{-8} cm/sec. Using *Darcy's Law*:

$Q=KiA$, or
$Q=K(\Delta H/L)A$, with

- a permeability value (K) of 1×10^{-7} cm/sec;
- a wall thickness (L) of 60 cm;
- an outward hydraulic gradient (ΔH) of 30 cm (approximately 1-foot); and
- an assumed cross sectional area (A) of 1 cm^2.

the rate of flow (Q) through the barrier wall would be:

$$Q \text{ (Volume/time)} = K(\Delta H/L)A$$
$$Q = (1 \times 10^{-7} \text{ cm/sec})\ [(30 \text{ cm}) / (60 \text{ cm})](1 \text{ cm}^2)$$
$$Q = 5 \times 10^{-8} \text{ cm}^3/\text{sec}$$

The travel time (time) it would take to have a breach in containment through the barrier wall with a 1-foot outward gradient would be:

$$\text{time} = \text{Volume} / Q$$
$$\text{time} = (60 \text{ cm} \times 1 \text{ cm}^2) / 5 \times 10^{-8} \text{ cm}^3/\text{sec}$$
$$\text{time} = 1.2 \times 10^9 \text{ sec (1 min per 60 sec * 1 hr per 60 min * 1 day per 24 hrs)}$$
$$\text{time} = 13{,}888 \text{ days (or approximately 38 years)}$$

As outlined in the U.S.EPA document, typical industry practices for monitoring vertical barriers consists of not only measuring cross-barrier head differentials but also monitoring groundwater quality downgradient of the barrier wall. Both of these routine practices are being conducted at the G&H Landfill Site to ensure the integrity of the barrier is maintained and that breaches of the wall do not occur.

Should you have any questions, please do not hesitate to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Gavin O'Neill

GO/sp/win6

c.c.: Lisa Summerfield
G&H Landfill PRP Group